

## **NON-SPECIFIC NECK PAIN AND EVIDENCE-BASED PRACTICE**

*Giannoula Tsakitzidis, PT*

*Roy Remmen, MD, PhD*

Faculty of Medicine and Health Care Sciences, Department of Primary and Interdisciplinary Care, General Practice, University of Antwerp, Antwerp, Belgium

*Wim Dankaerts, PT,MT, PhD*

Musculoskeletal Unit, Department of Rehabilitation Sciences, Faculty of Kinesiology and Rehabilitation Sciences K.U.Leuven, Leuven, Belgium

*Paul Van Royen, MD, PhD*

Faculty of Medicine and Health Care Sciences, Department of Primary and Interdisciplinary Care, General Practice, University of Antwerp, Antwerp, Belgium

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### **Abstract**

#### **Background**

Non-specific neck pain (NS-NP) is a common reason for adults to consult health care providers. Therefore one should always seek the most effective intervention(s) within the wide spectrum of treatments available. Equally important is to optimize evidence-based treatment decisions.

#### **Methods**

The first aim of this paper was to review (identify, critically appraise, and synthesize) the literature published on interventions for NS-NP. The second aim was to further provide advice for health care providers to make evidence-based treatment decisions and to optimize their delivery of care for diagnosing, treating and managing adults with NS-NP. Literature was systematically searched in PubMed, Cochrane, Embase and Pedro.

#### **Results**

Data could not be statistically pooled. History taking, excluding red flags and radicular pain/radiculopathy and assessing self-rated disability was deemed crucially important prior to selecting management and treatment modalities for NS-NP. Strong evidence of benefit was only found for multimodal care (manipulation/mobilization and supervised exercises) for chronic NS-NP. Consensus on proposed management was achieved by an expert panel. In contemporary practice there is a tendency to base the intervention on the underlying

mechanism of the disorder and to direct specific treatment. For this reason also we screened for targeted management based on the underlying mechanism.

#### Conclusions

A clinician should always exclude red flag pathology and also conduct precise history taking, and if needed also communicate with other health care providers. The diagnostic label ‘NS-NP’ suggests that this entity is in fact a heterogenic condition.

For the treatment of the diagnostic label ‘NS-NP’ strong evidence of efficacy was only found for multimodal care (manipulation/mobilization and supervised exercises).

Unfortunately there is a lack of evidence on accurate and reproducible characterization of subgroups of patients with a ‘NS-NP’ label to facilitate treatment to be tailored. For future research we suggest to focus on fine tuning the diagnosis and management beyond NS-NP, with specific attention for the underlying mechanisms driving the neck pain disorder subtype and the collaboration needed to accomplish this.

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**Keywords:** Neck pain, non-specific, treatment, management, primary care, general practice

#### Introduction

Neck pain is one of the most common and painful musculoskeletal conditions. Point prevalence ranges from 6% to 22% and up to 38% of the elderly population, while lifetime prevalence ranges from 14,2% to 71% (Fejer et al. 2006). For the majority of the neck disorders there is an absence of an identifiable underlying disease or abnormal anatomical structure. As a consequence they are classified as ‘non-specific’ ([http://www.cks.nhs.uk/neck\\_pain\\_non\\_specific](http://www.cks.nhs.uk/neck_pain_non_specific) ; Williams et al. 2004; Binder 2007; Binder 2007; de Jongh et al. 2007). This creates a lack of a “gold standard” assessment for NS-NP. From this perspective NS-NP is mainly ‘diagnosed’ on the basis of clinical grounds, provided there are no features to suggest a specific or more serious condition (Binder 2007). The symptoms of NS-NP are similar to those of whiplash associated disorders (WAD) grade I and II (Haldeman et al. 2008), but there is no traumatic event involved.

The natural course of NS-NP remains unclear. While it is often self-limiting within a few weeks of onset, it can severely limit daily functioning, induce substantial medical consumption and result in prolonged sick leave and disability. As a consequence it places a heavy burden on individuals, employers and health care services (Borghouts et al. 1999; Guez et al. 2002; Côté et al. 2003; Binder 2007).

Literature reveals many and diverse treatment approaches for NS-NP. Since for most patients with NS-NP definitive pathology cannot be identified this medical model fails to direct treatment. Most patients receive conservative treatment from a general practitioner or a physiotherapist. But question remains as to what have been the (diagnostic) indicators to direct the intervention?

A shift can be observed in the international literature, with an increasing amount of clinical research into neck disorders being directed towards understanding the pathophysiology of neck pain (Jull et al. 2007; Jull et al. 2009). This fits well with the clinical reasoning model used by physiotherapists in their physical examination of patients with neck pain.

In an effort to reduce the individual and societal burden of neck pain and its associated disorders and given the recent explosive growth of the neck pain literature, it is time to critically examine the evidence from a clinical perspective. The first aim of this paper was to review the literature published on interventions for NS-NP. Based on the provided best evidence synthesis, the second aim was to provide an answer by an expert panel to the question: can health providers make evidence-based treatment decisions to optimize their delivery of care for diagnosing, treating and managing adults who suffer from NS-NP? Finally suggestions for clinical practice and future research into NS-NP are formulated.

## **Methodology**

### **Selection criteria**

An interdisciplinary research team (2 musculoskeletal physiotherapists, 3 general practitioners, 1 neurologist, 1 rehabilitation specialist, 1 anaesthesiologist/pain specialist, 1 specialist neurosurgeon, 1 radiologist) formulated inclusion criteria for the selection of literature using the PICO question framework (Participants, Interventions, Comparators and Outcome) (Schlosser et al. 2007).

### **Inclusion criteria**

Adult *participants* (18 years and over) with NS-NP were included. The area of neck pain was defined to the cervical region, possibly with referred or radiating pain into the occiput, nuchal muscles, shoulders and upper limbs. Trials on following conditions were excluded : neurological disorders (i.e. irradiated pain) and headache as a consequence of specific headache diagnosis ; malignancy and infection; trauma (i.e. fractures); cerebrovascular insufficiency; chronic disease of the musculoskeletal system (e.g. polyarthritis, muscular disease); clinical features indicating ‘Red Flag’ pathology (table 1) ([http://www.cks.nhs.uk/neck\\_pain\\_non\\_specific](http://www.cks.nhs.uk/neck_pain_non_specific)).

All *interventions* related to diagnosis, prognosis, treatment and management were included. *Comparators* in the trials could be either the natural progress of symptoms or alternative procedures. All *outcomes* of management and treatment were included. Studies using data on patient satisfaction were excluded if no validated instrument for assessment was used.

<p>A serious underlying cause is more likely in people presenting with:</p> <p>New symptoms before the age of 20 years or after the age of 55 years</p> <p>Weakness involving more than one myotome or loss of sensation involving more than one dermatome</p> <p>Intractable or increasing pain</p> <p>‘Red flags’ that suggest compression of the spinal cord (myelopathy):</p> <p>Insidious progression</p> <p>Neurological symptoms: gait disturbance, clumsy or weak hands, or loss of sexual, bladder, or bowel function</p> <p>Neurological signs:</p> <ul style="list-style-type: none"><li>▪ Lhermitte’s sign: flexion of the neck causes an electric shock-type sensation that radiates down the spine and into the limbs.</li><li>▪ Upper motor neuron signs in the lower limbs (Babinski’s sign-up-going plantar reflex, hyperreflexia, clonus, spasticity)</li><li>▪ Lower motor neuron signs in the upper limbs (atrophy, hyporeflexia)</li></ul> <p>Variable sensory changes, with loss of vibration and joint position sense more evident in the hands than in the feet</p> <p>‘Red flags’ that suggest cancer, infection, or inflammation:</p> <p>Malaise, fever, unexplained weight loss</p> <p>Pain that is increasing, is unremitting, or disturbs sleep</p> <p>History of inflammatory arthritis, cancer, tuberculosis, immunosuppression, drug abuse, AIDS, or other infection</p> <p>Lymphadenopathy</p> <p>Exquisite localized tenderness over a vertebral body</p> <p>‘Red flags’ that suggest severe trauma or skeletal injury:</p> <p>A history of violent trauma (e.g. a road traffic accident) or a fall from a height. However, minor trauma may fracture the spine in people with osteoporosis</p> <p>A history of neck surgery</p> <p>Risk factors for osteoporosis: premature menopause, use of systemic steroids</p> <p>‘Red flags’ that suggest vascular insufficiency:</p> <p>Dizziness and blackouts (restriction of vertebral artery) on movement, especially extension of the neck when gazing upwards</p> <p>Drop attacks</p>
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Table 1: Red flags (Binder 2009)

### **Search strategy and quality assessment**

The medical subject heading (MeSH) keyword used was “Neck Pain” (<http://www.ncbi.nlm.nih.gov/pubmed/>). The electronic search covered the period from 1998 to 2008. Meta-analyses, SRs and RCTs were searched. The search engines were PubMed, Cochrane Database of SRs, Embase and Pedro search database. The search for guidelines was executed in Guidelines International Network, National Library of Guidelines, National Guideline Clearinghouse, New Zealand Guidelines, National Institute for Health and Clinical Excellence and Scottish Intercollegiate Guidelines Network.

In order to evaluate the quality of the publications seven reviewers were trained during a workshop and consensus was defined for appreciation based upon inclusion and exclusion criteria for studies. In the initial phase SRs and meta-analyses published in the last ten years were screened on full text by two reviewers and assessed with an instrument for evaluation of SRs (<http://www.cochrane.nl>). In the next phase, only RCTs published after the most recent SR included were screened on full text and critically appraised by two reviewers using an instrument for evaluation of RCTs (<http://www.cochrane.nl>).

In the final phase all conclusions were compared with published guidelines on diagnosis and treatment for adults with NS-NP. Guidelines were included after critical appraisal with the AGREE instrument (AGREE).

### **Data extraction**

Two researchers independently extracted the data from the included publications using pre-piloted forms. Data could not be statistically pooled because of the heterogeneity in the data outcomes.

To provide health care providers with a tool to support evidence based-practice for NS-NP, the final conclusions were labeled with the “Grade” system (table 2), expressing the quality of evidence in terms of grade A, B or C. Based upon this available evidence and the decision of the expert panel the strength of the recommendations were finally expressed in terms of “strong”, “weak” “in favour” or “against” (Guyatt et al. 2006).

#### Quality of evidence:

“Grade A”, highest level of evidence: RCTs without important limitations or overwhelming evidence from observational studies,

“Grade B”, moderate level of evidence: RCTs with important limitations (inconsistent results, methodological flaws, indirect, or imprecise) or exceptionally strong evidence from observational studies,

“Grade C”, lowest level of evidence: studies with lower level of evidence than above.

Table 2: Grade system (Guyatt, Gutterman et al. 2006)

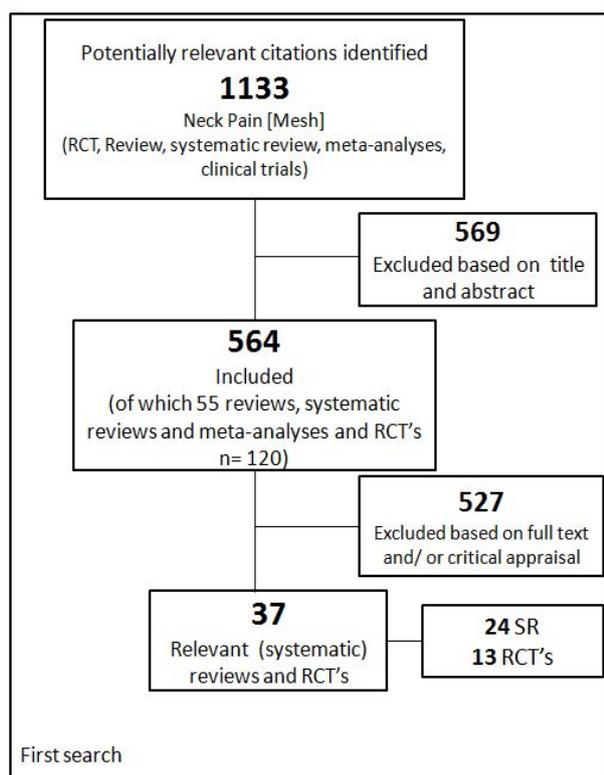
## Results

From the 1133 papers identified, 24 SRs and 13 RCTs on management and treatment were included (figure 1). We included 11 publications on diagnosis and prognosis from a possible 135 (figure 2) and two from six identified guidelines.

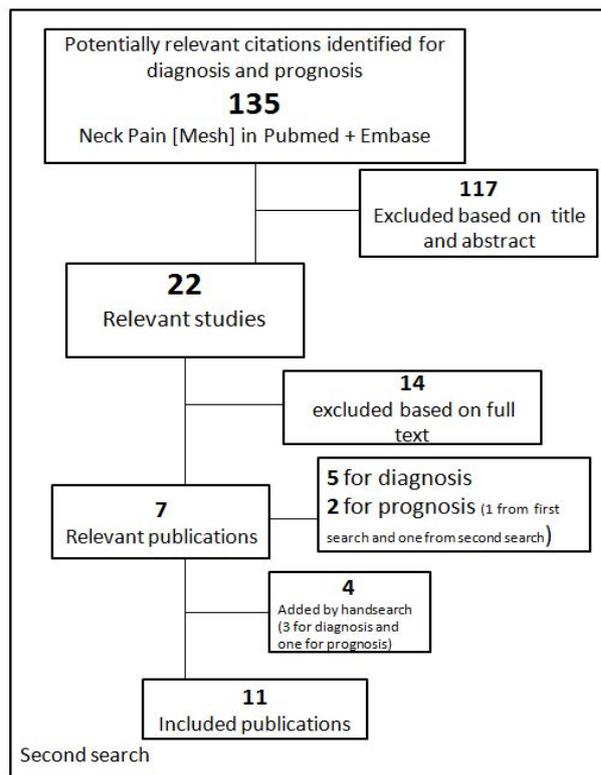
Proposed interventions for NS-NP from the literature with the level of evidence and strength of recommendation for practice are listed in table 3. Where possible, we also reported whether the researched intervention was applied to acute or chronic NS-NP.

Proposed management from the literature <sup>1</sup>	Best available graded evidence <sup>2</sup>	Conclusions for practice based on consensus by expert panel in terms of 'strong' or 'weak' combined with recommendations in terms of 'in favour' or 'against' <sup>3</sup>
<b>Diagnosis, assessing self-rated pain and prognosis</b>		
History taking	No evidence from the literature	Strong - in favour
Excluding red flags	Best available evidence from the literature	Strong - in favour
Diagnostic imaging	No evidence from the literature	Weak - against
The "Neck Disability Index" as instrument for self-rated disability	Level of evidence not applicable. Valid instrument	Strong - in favour
Confirm radiculopathy: spurling's test-traction/neck distraction-shoulder abduction-vasalva's manoeuvre	C	Weak - in favour
Rule out radiculopathy: negative Upper Limb Tension test	C	Weak - in favour
Diagnose facet joint spinal pain: local anesthetic block when no clinical diagnosis	C	Weak - in favour
Unfavourable prognostic elements: severity of pain; previous attacks; old age or concomitant low back pain	C	Weak - in favour
Pathologic radiological findings (e.g. degenerative changes) are not associated with worse prognosis	C	Weak - against
<b>Treatment of NS-NP</b>		
<b>Manual therapy</b>		
<i>Joint Therapy</i>		
Chronic NS-NP: multimodal approach: mobilizations/manipulations combined with supervised exercises	A - Effect on pain /function in short and long term	Strong - in favour
Acute and chronic NS-NP: manipulation/mobilization alone	B - No effect	Weak - against
Chronic NS-NP: traction	C - No effect	Weak - against
<i>Soft tissue therapy</i>		
Acute and chronic NS-NP: massage	C - No conclusion	Weak - against
<i>Exercises</i>		
Chronic NS-NP: supervised exercise: e.g. stretching and strengthening programs focusing on the cervical region, specific cranio-cervical flexion-exercises	B - Effect on pain/function in the long term	Weak - in favour

Chronic NS-NP: stretching and strengthening exercises alone	C – No effect	Weak - against
Chronic NS-NP: supervised exercise: stretching and strengthening of the shoulder region with exercises improving general condition	C - Effect on function in the short term	Weak - in favour
Chronic NS-NP: supervised exercise: eye-fixation and proprioceptive exercises	B - Effect on pain /function in the short term	Weak - in favour
Chronic NS-NP: isolated home exercises, isolated group exercises, neck schools	C - No effect	Weak - against
<b><i>Electrotherapy</i></b>		
Chronic NS-NP: transcutaneous electrical nerve stimulation (TENS) or electrical muscle stimulation (EMS) on trigger points	C - No effect	Weak - against
Acute and chronic NS-NP: low level laser therapy (LLLT); pulsed electromagnetic fields (PEMF)	C - Effect in the short term on pain/function (LLLT); on pain (PEMF)	Weak - in favour
Chronic NS-NP: thermal and ultrasonic agents	C - No effect	Weak - against
<b><i>Multimodal treatment</i></b>		
Subacute /Chronic NS-NP: supervised exercises in combination with passive treatment (mobilisation and/or manipulation) and forms of education	A - Effect on pain /function in the long term	Strong - in favour
Chronic NS-NP: manipulation/mobilization combined with electrotherapy or medication or other non-invasive modalities	C - No effect	Weak - against
<b><i>Multidisciplinary treatment</i></b>		
Chronic NS-NP: multidisciplinary approach	C - No conclusion	Weak - in favour
<b><i>Medication</i></b>		
Chronic NS-NP: local anaesthetic injection with lidocain into myofascial trigger points	C - Effect on pain in the short term	Weak - in favour
Acute and chronic NS-NP-paracetamol, NSAID's, opioids analgesics	C - Effect on pain in the short term	Weak - in favour
Chronic NS-NP: botulinium toxin A	B - No effect	Weak - against
Acute NS-NP: subcutaneous carbon dioxide insufflations	C - No effect	Weak - against
<b><i>Acupuncture</i></b>		
Chronic NS-NP: acupuncture (e.g. trigger points)	B - Effect on pain in the short term	Weak - in favour
<b><i>Other therapies</i></b>		
Chronic NS-NP: pillows in combination with exercises	C - Effect on pain in the short and long term	Weak - in favour
Chronic NS-NP: use of collars or oral splints	B - No effect	Weak - against
Acute and chronic NS-NP: isolated educational programs	B - No effect on pain or function in the short and long term	Weak - against
Chronic NS-NP: counseling programs for specific groups eg (female) computer workers	B - pain intensity and disability on short and medium term	Weak – in favour
<p>1. All different management approaches (reflect to diagnosis, assessment of self-rated pain, prognosis and treatment) found in literature and extracted as relevant by the SR-team.</p> <p>2. Best available evidence was defined following the GRADE system, based on the methodological quality of the included studies –following three categories: grade A, B and C (Guyatt, Gutterman et al. 2006)</p> <p>3. Conclusions to administer or not administer proposed management was made by an expert panel, on the basis of tradeoffs between benefits on the one hand, and risk, burdens and costs on the other (Guyatt, Gutterman et al. 2006)</p>		
<b>Summary of conclusions and recommendation for clinical practice</b>		



**Fig. 1: Flow chart: final results of the screening of the literature – first search**



**Fig 2: Flow chart: final results of the second search for diagnosis**

### Diagnosis, assessing self- rated pain and prognosis

Four publications (Rubinstein et al. 2007; Sehgal et al. 2007; Rubinstein et al. 2008; Van Zundert et al. 2009) investigated procedures to diagnose NS-NP. In order to make the diagnosis of NS-NP, serious spinal pathology or nerve root pain and red flags have to be excluded.

Based on four publications investigating pain and disability assessment, the Neck Disability Index is considered as the most strongly validated instrument for self-rated disability (Bjorksten et al. 1999; Vos et al. 2006; De Hertogh et al. 2007; Vernon 2008).

A few indicators of a less favourable prognosis of neck pain were identified, whereas radiological findings and diagnostic imaging were not associated with a less favourable prognosis (Borghouts et al. 1998; Hoving et al. 2004).

None of the included studies for diagnosis and assessing self-rated pain and prognosis delivered evidence for indicators that could direct to a specific intervention.

### Manual therapy

*Joint therapy involves* manipulation, mobilisation and traction. Manipulation involves a high-velocity thrust that is exerted through either a long or short lever-arm (di Fabio 1999). Mobilisation involves low-velocity (no thrust) passive motion. Manual and mechanical

traction is a technique applied with a traction force to the neck to separate two joint partners (Mink et al. 1990; Boyling et al. 2004; Graham et al. 2008).

Ten SRs analysed manipulation or mobilization as a possible non-invasive intervention. Manipulation and mobilisation combined with exercises were investigated within a multimodal approach and appear effective for chronic NS-NP (decreasing pain as well as improving function) in short- and long-term follow up (Gross et al. 2004; Kay Theresa et al. 2005; Sarigiovannis et al. 2005; Gross et al. 2007; Macaulay et al. 2007; Hurwitz et al. 2008). In contrast, results show that the effectiveness of manipulation and/or mobilization in isolation for acute or chronic NS-NP remains inconclusive (Gross et al. 2002; Gross et al. 2004; Sarigiovannis et al. 2005; Vernon et al. 2005; Gemmell et al. 2006; Cleland et al. 2007; Macaulay et al. 2007; Vernon et al. 2007; Vernon et al. 2007; Hurwitz et al. 2008). The existing evidence on cervical traction is limited and the evidence of possible benefits remains unclear (Gross et al. 2007; Graham et al. 2008). None of the studies used an underlying mechanism approach towards direct specific treatment strategies.

*Soft tissue* therapy involves massage, as a manipulation of the soft tissues with the hand, foot, arm or elbow on soft tissue structures (Haraldsson et al. 2006).

Four SRs assessed the effect of *massage* on pain and function (Haraldsson et al. 2006; Ezzo et al. 2007; Gross et al. 2007; Vernon et al. 2007). All reviews identified major methodological weaknesses of the individual studies, e.g. often a lack of uniform definition of the technique, dosage, the mode of performance and indication for the management.

*Exercises* involve bodily activities related to the neck region. There is moderate evidence of short- and long-term benefit on pain and function in chronic mechanical neck disorders for supervised exercises, e.g. stretching and strengthening programs focussing on the cervical and/or shoulder/thoracic region (Kay Theresa et al. 2005; Gross et al. 2007; O'Leary et al. 2007; Ylinen et al. 2007; Hurwitz et al. 2008). Nevertheless these treatments in isolation are not effective on neck muscle strengthening (Hakkinen et al. 2007; Haldeman et al. 2008). Other supervised exercises such as eye-fixation and neck proprioceptive exercises were found to be effective in the short-term for pain relief, function and general perceived effect (GPE) and in the long-term only for GPE (Sarig-Bahat 2003; Kay Theresa et al. 2005; Gross et al. 2007; Ylinen et al. 2007). Home exercises (not supervised), group exercises, neck school or single session of extension-retraction exercises cannot be supported by evidence (Kay Theresa et al. 2005; Gross et al. 2007; Hakkinen et al. 2008; Hurwitz et al. 2008)(Sarig-Bahat 2003). Targeted training for specific muscle groups assuming an underlying mechanism for the impairment was in most studies insufficiently described. Based

on these results, it is not possible to draw firm conclusions for selecting appropriate 'evidence-based' exercises for the management of NS-NP.

### **Electrotherapeutic modalities**

For electromagnetic therapy, pulsed electromagnetic field therapy and repetitive magnetic stimulation limited evidence was found for beneficial effects on neck pain (Hurwitz et al. 2008)(Kroeling et al. 2005; Gross et al. 2007; Hurwitz et al. 2008). Studies on low-level laser therapy demonstrated short term pain relief and positive functional changes for acute and chronic neck pain (Chow et al. 2005; Gross et al. 2007; Hurwitz et al. 2008). No benefit was found for other types of laser therapy for the treatment of neck pain. There is limited evidence of no benefit for thermal and ultrasonic agents in the treatment of NS-NP (Gross et al. 2007; Hurwitz et al. 2008).

### **Multimodal treatment**

Multimodal treatment is the combination of at least 2 different therapy modalities, for example exercises combined with mobilisation and medication.

For subacute/chronic mechanical neck disorders, multimodal approaches including stretching/strengthening exercise and mobilisation/manipulation reduced pain, improved function and resulted in favourable GPE in the long term (Gross et al. 2007). It was concluded that a multimodal approach should consider (supervised) exercises in combination with passive treatment (mobilisation and/or manipulation) and forms of education (Gross et al. 2002; Kay Theresa et al. 2005; Gross et al. 2007; Hurwitz et al. 2008). However, there is lack of information on the specific contribution of the individual modalities to the overall effect.

No evidence was identified as to the most suitable combination of exercise type or intensity of training for each subgroup of patients among all adults with NS-NP.

### **Multidisciplinary approaches, methods or treatments**

Multidisciplinary approaches, methods or treatments require a team of therapists from different disciplines working with the same patient together or alone and without a common discussed purpose (Tsakitzidis G and Van Royen P 2008). The main difference between a multimodal and multidisciplinary intervention are the therapists involved. While one therapist can give multimodal therapy, multidisciplinary treatment requires different therapists from different disciplinary background.

Two SRs investigated the effect of multidisciplinary approaches for the treatment of patients with neck pain (Karjalainen et al. 2003; Hurwitz et al. 2008). Within a multidimensional framework for NS-NP, the hypothesis remains that several disciplines working towards all underlying factors of the disorder, should be more effective.

Nevertheless the effect of the multidisciplinary and interprofessional collaboration approaches has not been investigated as an intervention for adults with NS-NP.

### **Medication**

There is lack of specific studies on any medicinal treatment for NS-NP to allow strong recommendation for treatment by medication. Possible relevant medication treatments for NS-NP with their level of evidence are listed in table 3 (Gross et al. 2007; Peloso PM et al. 2007; Brockow et al. 2008; Hurwitz et al. 2008). Based on this current evidence from the literature a health care provider still does not know when and why medication should be given or for what indications medication therapy should be combined with other modalities.

### **Acupuncture**

Acupuncture is the insertion of needles into the body to reduce pain or induce anaesthesia. The most thoroughly studied mechanism of stimulation of acupuncture points employs penetration of the skin by thin, solid, metallic needles, which are manipulated manually or by electrical stimulation (<http://www.medterms.com/script/main/art.asp?articlekey=2132>).

There is strong to moderate evidence that acupuncture is effective for pain relief compared with inactive treatments either immediately post-treatment or in short- and intermediate follow-up for NS-NP (Trinh et al. 2006; Vas et al. 2006; Gross et al. 2007). There is heterogeneity in acupuncture interventions (trigger point acupuncture, classical, and others) and their results. Trigger point acupuncture seems more effective than some other types of acupuncture for pain relief, measured immediately after the treatment session and at short-term follow-up (Itoh et al. 2007). While evidence for effect of acupuncture was found, one does not get the important clinical information of frequency or the exact points to be acupunctured.

### **Other interventions**

For the use of *pillows* alone some studies in two SRs showed positive effects on pain reduction. No evidence for the use of pillows in isolation were found (Shields et al. 2006; Gross et al. 2007). One RCT showed a significant effect for the use of a neck support during sleeping in combination with exercises (Helewa et al. 2007).

There is moderate evidence of no benefit from one SR for the use soft collars for patient with NS-NP (Gross et al. 2007). This SR demonstrated moderate evidence of no benefit for the effect of oral splints.

Education programs and providing advice are methods which intend to influence the learning experience, illness beliefs and behaviour of the patient with NS-NP (Haines et al. 2008). There is evidence of no benefit for education programs as treatment for NS-NP when

compared with no treatment or to other treatments (Gross et al. 2007; Haines et al. 2008; Hurwitz et al. 2008). A group-based work style intervention or ergonomic counselling in computer workers seems to be effective (Voerman et al. 2007; Bernaards et al. 2008) .

### **Non-specific neck pain: Can we practice evidence-based?**

The first objective of this study was to identify, critically appraise, and synthesize the literature published on interventions for NS-NP. From 1133 hits from the search only 48 publications met the criteria for this SR. It has to be acknowledged that due to the strict methodology, only including publications on NS-NP, relevant interventions could have been missed. Researchers should report more specifically which interventions are indicated for NS-NP populations seen as a subgroup within a population of patients with neck pain.

The second objective of this study was to evaluate the possibility of recommending diagnosis and management approaches based on the available evidence from the literature and the opinion of the expert panel. From these results it appears that receiving the diagnostic label 'NS-NP' does not provide strong 'evidence based' directions for treatment. Nevertheless the individual and societal burden of neck pain and its associated disorders is not be underestimated (Borghouts et al. 1999; Guez et al. 2002; Côté et al. 2003; Binder 2007). While there was no evidence found in the literature regarding history taking for NS-NP (Rubinstein et al. 2008) our expert panel strongly advises to exclude red flag pathology and also to conduct a thorough history taking process. This is crucially important prior to selecting management and treatment modalities for NS-NP. The panel was also strongly in favour for assessing self-rated disability. Therefore communication and collaboration between care providers and the patient can be an essential hypotheses? Nevertheless regarding management approaches strong evidence of benefit (grade A) was only found for multimodal care (manipulation/mobilization and supervised exercises) but not for multidisciplinary approaches. Combining at least these two different therapy modalities, seems the most effective management approach for chronic NS-NP. This was also confirmed by the expert panel (strongly in favour). For other intervention approaches lower graded evidence was found for NS-NP patients (table 3). Despite the limited evidence for specific intervention for NS-NP, the conclusions of this SR can still be applied as a guide to clinical decision making for NS-NP. While limited evidence exists on pharmaceutical therapy for NS-NP conclusions of this report on pain management for NS-NP patients should also be complemented with other evidence or guidelines on pain management.

### **Why is there limited evidence for ns-np?**

While “NS-NP” has been described by several authors, the term remains a rather broad and vague concept. Although there is little current evidence to support its validity, among clinicians there is a strong belief that NS-NP is a heterogenic condition, and patients should be treated based on this heterogeneity. Indeed, it is considered that the heterogeneous group of NS-NP consists of several smaller homogenous subsets, with each subset being more likely to respond to a type of treatment. This implies that particular conservative treatments may be more efficacious with certain subsets of patients than for the whole heterogeneous group of NS-NP sufferers. There has been a strong recommendation from the panel to establish methods of classification that will distinguish one subset of NS-NP from another. This implies more collaboration between professional care providers.

An important finding from reviewing the literature was also that to our best knowledge no studies were found targeting hypothesized underlying mechanisms for the impairments in the individual NS-NP patient. Only evidence on excluding radiculopathy (with description of the techniques) and assessing self-rated pain disability were found in the literature (Vos et al. 2006; De Hertogh et al. 2007; Rubinstein et al. 2007; Sehgal et al. 2007; Rubinstein et al. 2008; Vernon 2008; Van Zundert et al. 2009).

It also seems important to select management strategies based on targeting the underlying mechanisms for NS-NP versus choosing a ‘one size fits all’ management approach for a heterogenic group of patients with neck pain. The identification of subgroups of NS-NP patients based on diagnostic procedures and targeted treatments might result in a better outcome.

### **Conclusion: Where Do We Go From Here?**

A clinician should always exclude red flag pathology and also conduct precise history taking, and if needed also communicate with other health care providers. The diagnostic label ‘NS-NP’ suggests that this entity is in fact a heterogenic condition.

For the treatment of the diagnostic label ‘NS-NP’ strong evidence of efficacy was only found for multimodal care (manipulation/mobilization and supervised exercises).

For future research we suggest to focus on fine tuning the diagnosis and management beyond NS-NP, with specific attention for the underlying mechanisms driving the neck pain disorder subtype and the collaboration needed to accomplish this. These sub-classification strategies should operate within a bio psychosocial framework and be integrated into future RCT’s investigating specific interventions for NS-NP.

These interventions should also target the underlying physiological and pathological mechanisms. Attempts should be made to characterize the responders to the various therapeutic interventions. To allow this an additional feature in the design of future trials on NS-NP should require to return to the underlying mechanism of the neck disorder subtype and the collaboration needed to accomplish this. Otherwise evidence-based research into NS-NP will be unlikely to provide useful insight into more effective management for this complex disorder.

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